

Introduction

5-ALA fluorescence-guided surgery significantly contributed to increase the extent of resection (EOR) of high grade gliomas, allowing detection of pathological tissue also in areas surrounding the tumoral contrast-enhanced nodule. EOR measurement is based on comparison between pre- and post-operative volumetric evaluation of contrast enhancing tumor on T1 with gadolinium Magnetic Resonance (MR) sequences. This study tests the efficacy and reliability of EOR evaluation of high grade gliomas based on 3D FLAIR MR images used for intra-operative navigation and post-operative measurement.

Methods

16 patients have been prospectively included. All patients underwent a pre-operative MR protocol study including spectroscopy, 3D contrast-enhanced T1, 3D FLAIR and Diffusion Tensor Imaging (DTI). Both 3D post-contrast T1 and FLAIR sequences have been used for intra-operative navigation. The correspondence between intensity of fluorescence and MR images has been evaluated by neuronavigation. Volumetric evaluation of extent of resection has been performed using manual segmentation on 3D FLAIR sequences of pre- and post-operative MR. The same evaluation has been performed on a second series of 25 patients retrospectively evaluated.

Results

Correlation between 3D FLAIR, 3D T1 post-contrast images and intraoperative 5-ALA fluorescence revealed correspondence between enhancing tumor and intense fluorescent areas in all cases.

Peri-tumoral zones, detectable on 3D FLAIR sequences as hyperintense areas, appeared with vague fluorescence and were histologically demonstrated as pathological infiltrating areas in 12 of 16 patients. Volumetric evaluation based on 3D-FLAIR MR has been performed in 41 patients. In 21 patients residual tumor was detected, despite traditional volumetric evaluation based on T1 post-contrast MR showed complete resection in all cases. Only three of these 21 patients were included in the prospective group.

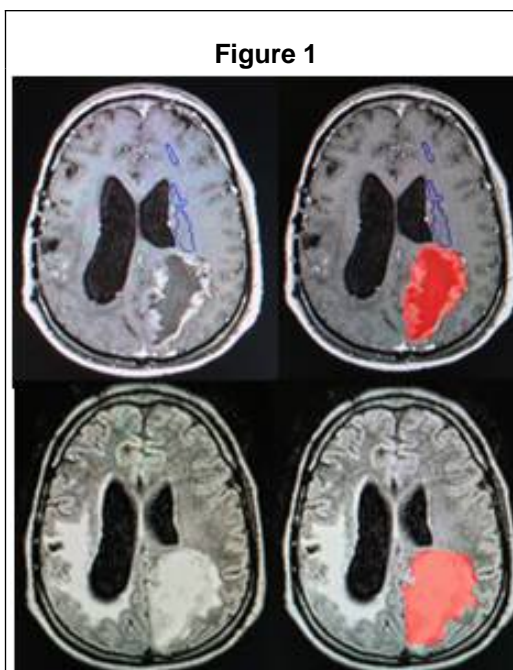


Figure 1

Volumetric segmentation of the same lesion in T1 gad and FLAIR sequences demonstrates the different size of tumor

Conclusions

Resection based on 3D FLAIR images is wider than that based on post-contrast T1 sequences. The safety of such wider resection relies on the use of navigated tractography and neuromonitoring. The validity of the method here proposed will have to be supported by survival data.

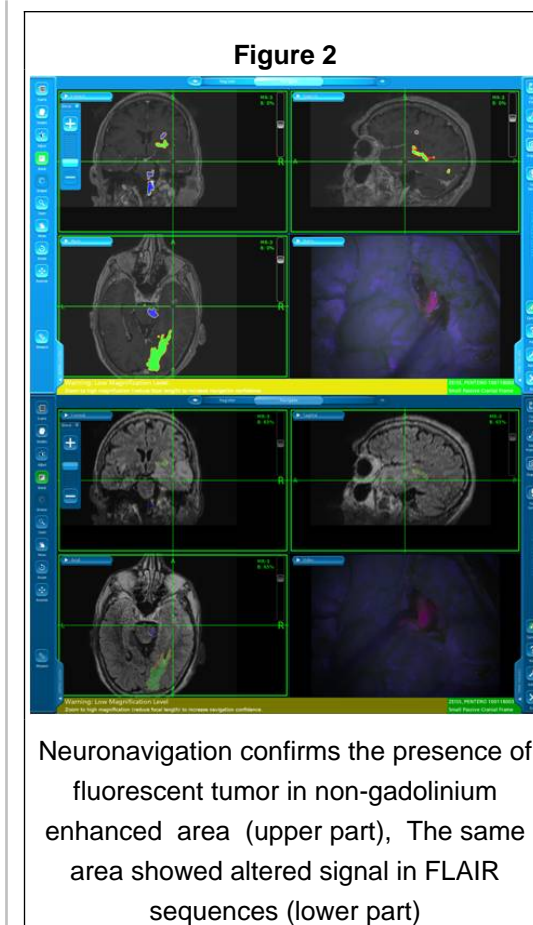
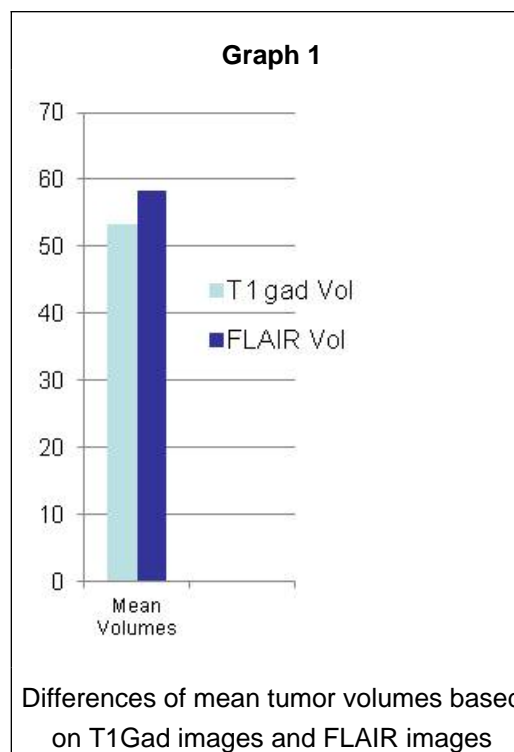


Figure 2

Neuronavigation confirms the presence of fluorescent tumor in non-gadolinium enhanced area (upper part), The same area showed altered signal in FLAIR sequences (lower part)

References

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